CBOC PERFORMANCE EVALUATION

Performance Report 2: Cost and Access Measures

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by

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HIGHLIGHTS

The CBOC Performance Evaluation Project was initiated in 1998 in response to the Under Secretary for Health's request that HSR&D formulate a plan for evaluating CBOC performance and conduct a system-wide evaluation of CBOCs. For the purposes of this project, CBOCs are defined as outpatient clinics that successfully completed the congressional review process for CBOCs, and include only the 139 CBOCs that began providing health care to veterans between March 1995 and September 1998.

The evaluation examined CBOC performance on 25 potential performance measures identified by a national committee of VA managers and researchers. Performance measures were identified in six domains: access, cost, mental health, quality of care, patient satisfaction and utilization. This is the fourth in a series of reports for this project.[1] It provides results for three cost and two access measures of CBOC performance.

When the access and cost measures examined in this report are considered in conjunction with the performance measures presented in Performance Report 1, CBOCs appear to generate greater access to care and lower total cost per patient compared to the affiliated Parent VAMCs, as well as greater satisfaction and lower utilization of specialty care. Although the limitations of the analyses require caution in generalizing the results, these performance measures suggest that CBOCs may be a valid and promising approach for providing primary care to veterans. More specifically, the five measures in this report show that:

1. **Based on a small sample of CBOCs, CBOC patients appear to have higher primary care costs but lower total costs per patient than primary care clinic patients at the parent VAMC.**

The three cost measures – average direct cost per primary care visit, average primary care direct cost per patient, and total direct cost per patient – are based on data from the Decision Support System. The analyses of cost measures are based on a small sample (18 of 139 CBOCs) because of limited data availability. The analyses excluded Contract CBOC patients,[2] indirect costs, and estimates of non-VA care in order to base the findings on the most reliable data available. Also to be noted, the estimates for patients in new CBOCs and rural CBOCs are based on a small number of total facilities. As a result, these findings cannot necessarily be generalized to all CBOCs in the VA system, but they do accurately represent a selected sample of large CBOCs for the last two quarters of fiscal year 1998.

Within these constraints, in comparisons adjusted for patient demographics, we found that:

- CBOC patients had higher average primary care costs than patients seen in VAMC primary care clinics, in terms of both direct cost per primary care visit and total primary care direct cost per patient.

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1 The other reports are listed at the end of this report.

2 A more detailed discussion of Contract CBOCs is provided on pages 17-19.

- The greater primary care costs were offset by lower ancillary costs for CBOC patients so that average total direct costs per patient were lower in CBOCs than in VAMC primary care clinics.
- CBOC patients in urban CBOCs had greater primary care costs than patients in rural CBOCs, but not significantly different total costs.
- Patients in new CBOCs (established in FY 1998) had greater primary care costs than patients in old CBOCs, but not significantly different total costs.

Given the CBOC goals of improving access and convenience of primary care, the finding of increased primary care costs is not surprising and is consistent with the higher primary care utilization presented in Performance Report 1. The higher direct cost per primary care visit in VA-staffed CBOCs may reflect more resource intensive care being provided in longer visits since CBOCs are less likely to have onsite specialty and emergency care, and clinicians may want to save patients the additional time and effort of traveling to a VAMC. Urban CBOCs may have higher per visit costs than rural CBOCs because their practice patterns are more intense and their costs, such as salaries, are higher. New CBOCs may have higher per visit costs than old CBOCs because of startup costs or because of longer visits associated with initial examinations of new patients. Across CBOC groups, the higher primary care cost per patient reflects higher costs per visit.

With lower ancillary costs offsetting the higher primary care costs for CBOC patients, CBOCs may offer a cost-efficient alternative to providing primary care at parent VAMC clinics if these findings can be supported in a larger sample of CBOCs. Attention should be paid, however, to ensure that the lower ancillary costs result from more resource-intensive primary care at the CBOC, or from better health of CBOC patients (in ways not captured by our limited adjustments for case-mix differences). Care should be taken to ensure that lower ancillary costs do not reflect unmet needs that result because CBOCs services are inadequately coordinated with parent VAMC services or because distances to the parent VAMC are too great for veterans to willingly travel.

Because Contract CBOCs were excluded from the cost comparisons, we conducted case studies of three Contract CBOCs to better understand their costs as reported in DSS. We found the costs to be highly variable. The quality of DSS data for Contract CBOCs (and all VAMC clinics) depends directly upon accurate accounting of utilization in ViSTA and workload in the Financial Management System (FMS), which are the data sources for DSS. For contract organizations, such as Contract CBOCs, that do not have shared computer networks with the VAMC, careful tracking of workload is critical. DSS data used in any cost calculations using Contract CBOCs must be reviewed carefully for validity and consistency with other sites. Contract CBOCs should be explored in greater detail given the complexities in estimating costs for these facilities.

2. CBOCs significantly improve geographic access for veterans.

The two access measures – average travel distance for CBOC patients to the CBOCs versus the Parent VAMCs, and percent of high priority veterans who reside within 30 miles or 31-60 miles of a VA facility but do not use VA primary care – are based on data from the Planning Systems Support Group and the Austin Automation Center.

In comparing CBOCs with parent VAMCs and comparing types of CBOCs, we found that:

- CBOC patients had a substantially shorter average estimated one-way travel distance from their residences to the CBOCs (15 miles) than to the affiliated Parent VAMCs (56 miles).
- CBOCs had a lower percent of high priority veterans (priority levels 1 and 2) residing within a 30-mile radius who do not use VA primary care than did the Parent VAMCs.
- Patients at rural, new and Contract CBOCs had a greater reduction in travel distance than the patients at urban, old and VA-staffed CBOCs. (There were no significant differences between types of CBOCs in the percent of high priority veterans residing within a 30 mile radius who were non-VA users.)

These findings suggest that CBOCs have been successful in improving geographic access, an important objective of expanding community-based care to veterans.

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INTRODUCTION

From 1995 to 1998, VHA approved more than 230 Community-Based Outpatient Clinics (CBOCs). By the end of FY 98, there were 139 CBOCs providing health care to veterans with the number of CBOCs per Veterans Integrated Service Network (VISN) ranging from one to 16. In order to learn about the characteristics and performance of the rapidly growing number of CBOCs, the Under Secretary for Health requested that the Health Services Research and Development Service (HSR&D), through its Management Decision and Research Center (MDRC), conduct a system-wide evaluation of CBOCs.

In response to the Under Secretary's request, the MDRC contracted with the HSR&D Center of Excellence at Seattle, in collaboration with the HSR&D Centers of Excellence in Little Rock and Minneapolis, to conduct the evaluation. A national CBOC Performance Evaluation Committee was convened to develop a set of CBOC characteristics and CBOC performance measures by which CBOCs would be categorized and evaluated. The committee recommended assessment of CBOC performance in six domains: Access, Cost, Mental Health, Quality of Care, Patient Satisfaction, and Utilization. The nominated measures are listed in Table 1.

Reported here are results for five CBOC performance measures that are based on data from the Decision Support System, the Planning Systems Support Group, and the Austin Automation Center. This subset of measures is in bold print in Table 1. For each performance measure, the Performance Evaluation Committee set a standard for the CBOCs. For most measures the standard states that CBOC performance should be at least equal to the performance of the associated Parent VA facility.

This is the fourth in a series of reports for this study. The first report detailed the CBOC characteristics and performance measures formulated by the committee. The second report presented characteristics for each CBOC as reported through the VISNs. The third report provided results for 12 CBOC performance measures based on data from the Austin Automation Center and the National VA Outpatient Customer Satisfaction Survey. The current report provides results for five CBOC performance measures -- three Cost and two Access measures -- based on data from the Decision Support System, the Planning Systems Support Group, and the Austin Automation Center. The final performance report will present additional measures based on data from CBOC medical record reviews. The reports are listed at the end of this report.

Table 1. Nominated CBOC Performance Measures

Access
Access 1: Average travel distance for CBOC patients (in different priority and user categories) to the CBOCs vs the Parent VAMCs
Access 2: Patients seen within 20 minutes of scheduled appointment
Access 3: Average waiting time for follow-up after hospitalization or surgery
Access 4: Percent of veterans who were able to access medical care when they needed care
Access 5: Percent of priority 1 and 2 veterans not using VA primary care and residing within 30 miles or 31-60 miles of a VA facility
Cost
Cost 1: Average direct cost per primary care visit
Cost 2: Average primary care direct cost per patient
Cost 3: Average total direct cost per patient
Cost 4: Change in fee-basis costs before and after activation of the CBOC
Mental Health
Mental Health 1: Patients assigned a mental health diagnosis
Mental Health 2: Average weighted outpatient workload per clinical mental health FTEE
Mental Health 3: Patients seen within 30 days after hospitalization for a mental health Disorder
Quality of Care
Quality of Care 1: Patients reporting one provider or team in charge of care
Quality of Care 2: Prevention Index
Quality of Care 3: Chronic Disease Care Index
Patient Satisfaction
Patient Satisfaction 1: Average Customer Service Standard (CSS) score on the ambulatory care customer feedback survey
Patient Satisfaction 2: Patients rating healthcare as very good or excellent
Patient Satisfaction 3: Patients rating their VA healthcare encounter as equivalent to or better than what they would receive from any other healthcare provider
Utilization
Utilization 1: User status and priority status of patients
Utilization 2: Average number of VA primary care visits per patient
Utilization 3: Average weighted outpatient workload per clinical FTEE
Utilization 4: Average number of VA specialty visits per patient
Utilization 5: Patients who have: 1) seen a non-VA physician in the past 12 months, 2) been admitted to a non-VA hospital in the past 12 months
Utilization 6: VA bed days of care per patient
Utilization 7: Average number of VA hospital admissions per 1000 patients

Note: Bold font denotes performance measures included in this report. Italicized font denotes performance measures included in Performance Report 1.

METHODS

The methods used to conduct the analyses presented in this report are summarized in this section. A more complete description of the methods and performance measures is contained in Appendix A and Appendix B.

Definitions

Community-Based Outpatient Clinics (CBOCs): For the purposes of this report, CBOCs are defined as Community-Based Outpatient Clinics that successfully completed the congressional review process for CBOCs. Satellite outpatient clinics, outreach clinics, and other community-based clinics are not included in this definition. Although 139 CBOCs received congressional approval and began providing health care to veterans between March 1995 and September 1998, only a subset of these CBOCs met the inclusion criteria for the performance measures in this report (see text below and Appendix C).

CBOC Patient: A CBOC patient is defined as a veteran who had a least one visit to a CBOC during 4/1/98 through 9/30/98. Note that for the Austin Automation Center (AAC) based measures in Performance Report 1,[3] 14.1% of veterans defined as CBOC patients also had at least one stop at the primary care clinic of the Parent VAMC during the study period, but only 3.1% of CBOC patients had more primary care stops at the Parent VAMC than at the CBOC.

Parent VA Facility: This report compares performance measures for CBOC patients and patients at the primary care clinics of the Parent VA facilities. A Parent VA facility is defined as the VA facility affiliated with a CBOC as reported by each VISN on a survey conducted by the CBOC Performance Evaluation Project.

Parent VAMC Patient: A Parent VAMC patient is defined as any veteran who had a primary care stop at one of the Parent VA facilities, but who did not visit a CBOC between 4/1/98 and 9/30/98.

Methods

Cost 1: Average direct cost per primary care visit
Cost 2: Average primary care direct cost per patient
Cost 3: Average total direct cost per patient

This report includes three CBOC performance measures that are based on clinical and administrative data routinely collected by each VAMC and compiled into a cost accounting

[3] CBOC Performance Evaluation. *Performance Report 1: Measures Based on Austin Automation Center and Patient Survey Data.* HSR&D Management Decision and Research Center. Department of Veterans Affairs. July 1999.

system called the Decision Support System (DSS). Ancillary costs were excluded from the two primary care cost measures and indirect (overhead) costs were excluded from all three cost measures. Direct costs refer to all costs directly associated with patient care, such as physician and nurse time and medical supplies. Primary care direct costs were calculated on a per visit and per patient basis; and total direct costs include all primary, specialty, ancillary and inpatient care.

To be included in the analysis of DSS cost data, a CBOC must have recorded a visit before 4/1/98. Of the 139 CBOCs established by the end of FY98, 38 met this inclusion criterion. Encounters in the first half of FY98 (10/1/97 to 3/30/98) could not be included in the analysis because too few CBOCs had recorded visits at the beginning of FY98. An additional 20 CBOCs were excluded because DSS cost data were not available. Finally, Contract CBOC patients were excluded from the analysis because of uncertain validity of the per visit and per patient data. Issues in the analysis of cost in contracted CBOCs are discussed in more detail on page 16. These exclusions resulted in a final sample of 8,227 patients in 18 VA-staffed CBOCs and 131,051 patients in 14 Parent VAMCs (see Appendix C). The patient is the unit of analysis for the cost measures.

All cost comparisons were conducted using multivariate regression analysis to control for observable demographic differences and other factors that might influence cost per visit or cost per patient. Observable adjustment factors that were included in each regression were age, race, marital status, percent service connected, gender, and Diagnosis Cost Group (DCG).[4] VA-staffed CBOCs had patients with a lower level of service connection and older patients, on average, than the VAMCs. A greater percentage of VAMC patients were unmarried and African American or Hispanic. For the subsample of 8,227 patients in 18 VA-staffed CBOCs, comparisons between rural and urban CBOC patients and between old (established in FY95, FY96 or FY97) CBOC patients and new (established in FY98) CBOC patients were made. Rural CBOCs had slightly lower percent of service connected patients, fewer female patients and a lower average age, but higher percent of Caucasian patients compared to urban CBOCs. Finally, new CBOCs had a much lower percent of service connected patients, but a higher average age and a higher percent of Caucasian patients and married patients than old CBOCs.

VISN-level comparisons were not calculated for the three cost measures to protect the confidentiality of these costs at the facility and VISN level. Given that the final sample had only 18 CBOCs (12.9% of all CBOCs) and 14 VAMCs, identification of facilities within each VISN would have been possible.

[4] The Diagnosis Cost Groups were originally developed from diagnoses on hospital bills to predict expenditures. DCGs in this study were based upon a more recently developed model that used both inpatient and outpatient diagnoses over a two-year period. Higher scores on the index imply greater comorbidity. See Ellis, Pope, Iezzoni, Ayanian, Bates, Burstin and Ash, "Diagnosis-based risk adjustment for Medicare capitation payments," *Health Care Financing Review*, Vol. 17(3), 1996, p. 101-128.

Access 1: Average travel distance for CBOC patients (in different priority and user categories) to the CBOCs vs the Parent VAMCs

Access 5: Percent of priority 1 and 2 veterans not using VA primary care and residing within 30 miles or 31-60 miles of a VA facility

To be included in the access analyses, CBOCs had at least one visit recorded in the Austin Automation Center (AAC)[5] Outpatient Encounter File prior to 4/1/98 and treated at least 50 patients between 5/15/98 and 7/15/98. Of the 139 CBOCs established between FY95 and the end of FY98, 38 met these inclusion criteria (see Appendix C). These 38 CBOCs were affiliated with 32 Parent VAMCs and located in 16 VISNs.

The analysis of travel distance included veterans who had an encounter at the CBOC during the second half of FY98 and a residential zip code in the AAC database that matched with a zip code file containing 1999 US Postal Service zip codes with latitude and longitude centroids.[6] The 38 CBOCs in the study treated 37,084 veterans between 4/1/98 to 9/30/98, and 97.4% or 36,137 veterans had zip code information compatible with the inclusion criteria.

The distance from a veteran's residence to the CBOC where he/she received care and to the Parent VAMC was estimated using straight-line distance between the zip code centroids. Comparisons of the average estimated distance traveled by CBOC patients to the Parent VAMC versus to the CBOC were made using the paired t-test. The estimated distances traveled were compared in a single aggregate comparison, and in separate within-VISN comparisons for each VISN in which the sample CBOCs were located.

Distance comparisons were also made between the following types of CBOCs and types of veterans: 1) VA-staffed versus Contract-staffed CBOCs, 2) urban versus rural CBOCs,[7] 3) old versus new CBOCs,[8] 4) high priority veterans versus low priority veterans,[9] and 5) old VA users versus new VA users.[10] For these analyses, the difference in average estimated distance traveled by CBOC patients to the Parent VAMCs minus the distance traveled to the CBOCs was compared across CBOC and veteran categories using t-tests for independent samples.

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5 Clinical and administrative data routinely collected by each VAMC are compiled in a nationwide database housed at the Austin Automation Center (AAC).

6 The 1999 ZipList Geocode file has latitude and longitude fields that contain geographic coordinates in degrees of the "centroid" of the zip code area.

7 CBOCs were categorized as urban if located in an MSA county, and as rural if located in a non-MSA county.

8 CBOCs were categorized as "old" or "new" based upon the date patients were first seen in a CBOC according to the VISN survey administered by the CBOC Performance Evaluation Project. CBOCs established in FY95, FY96 and FY97 were defined as "old" and CBOCs established in FY98 were defined as "new."

9 Patients with service-connected conditions rated 30 percent or higher (priority levels 1 and 2) were defined as "high priority" and all other veterans were defined as "low priority."

10 Patients were categorized by user status as an "old user" or "new user" based on inpatient and outpatient utilization data. Patients with visits or admissions in FY95, FY96, and FY97 were defined as old VA patients or "old users," and patients with visits or admissions in only in FY98 were defined as new VA patients or "new users."

To estimate the percent of Priority 1 and 2 veterans residing within 30 miles and 31-60 miles of the CBOCs and the Parent VAMCs but not using VA primary care services, we used Planning Systems Support Group, Austin Automation Center, and 1999 US Postal Service zip code data. The CBOCs and Parent VAMCs were compared using the paired t-test. Additional analyses using an independent sample t-test compared the percent of Priority 1 and 2 non-users across types of CBOCs: 1) VA-staffed versus Contract CBOCs, 2) rural versus urban CBOCs, and 3) old versus new CBOCs. The sample size was insufficient to perform separate within-VISN comparisons.

Limitations

The methods used for this report are subject to several important limitations. First, the data on which the cost measures were based are derived from the DSS Outpatient and Inpatient Extracts for the last two quarters of fiscal year 1998. This dataset has not been validated at the local or national level to ensure that the cost estimates obtained for a given facility represent the actual costs for a given encounter in that facility. Thus, the relative magnitude of results from this study, not specific point estimates, should be considered. Second, the small number of CBOCs and VAMC primary care clinics limit the generalizability of our results. For the cost measures, Contract CBOC patients were excluded entirely because of uncertain validity of DSS cost data for patients in these CBOCs. Third, differences between CBOCs and parent VAMCs may exist that are not adequately accounted for by the demographic and other adjustments we explored, because we had only one health status proxy. Fourth, it is also important to note that only six months of data were available to calculate the measures and that some CBOCs were only open a short period of time before the evaluation period began.

RESULTS FOR PERFORMANCE MEASURES

For each of the five performance measures, two figures are presented on the following pages:

- *CBOC vs. Parent VAMC:* This figure shows a comparison between all CBOCs and all associated Parent VA facilities included in the analysis.
- *Comparison by CBOC Characteristics:* This figure presents the findings of separate analyses comparing rural versus urban CBOCs and CBOCs established in FY98 (new) versus CBOCs established in FY97, FY 96 or FY95 (old). In addition, for Access 1 and 2 there is an analysis comparing VA-staffed to Contract CBOCs, and for Access 1 there is also a comparison between high priority versus low priority veterans[11] and old versus new VA-users.[12]

For the first Access measure, a third figure is also presented:

- CBOC vs. Parent VAMC, by VISN – This figure shows within-VISN comparisons between CBOCs in the VISN and the associated Parent VA facilities. Several VISNs did not have CBOCs included in this analysis (see Methods for details). For the other performance measure analyses, there was an insufficient number of CBOCs and Parent VAMCs to perform within-VISN comparisons.

Throughout the results section, we report whether the performance measures differed significantly across treatment locations (e.g., CBOC versus Parent VAMC). The significance of the difference is statistical and does not necessarily indicate that the difference in the performance measures is clinically or policy relevant. The statistical significance simply reflects whether the impact of treatment location was different from zero. To help readers determine whether statistically significant differences are clinically or policy relevant, the results have been reported graphically as well as in text. The figures for the cost measures represent the predicted value of the performance measure for an average patient across all facilities being compared. The cost measures should not be compared to results in other summary reports based on AAC, DSS, or NPDRC data, because the cost measures were based upon a subset of patients in earlier reports and calculated cost differences using an average patient method to control for all differences except facility. See Appendix B for more details on the cost analyses.

Please note that the VISN-level results for Access 1 are based on a relatively small number of CBOCs (and in some cases only one). Therefore, the performance reported for each VISN should be interpreted with some caution. It is also important to note that the VISN level analyses were designed to compare the performance of CBOCs and Parent VAMCs within each VISN, and are not appropriate for comparisons across VISNs.

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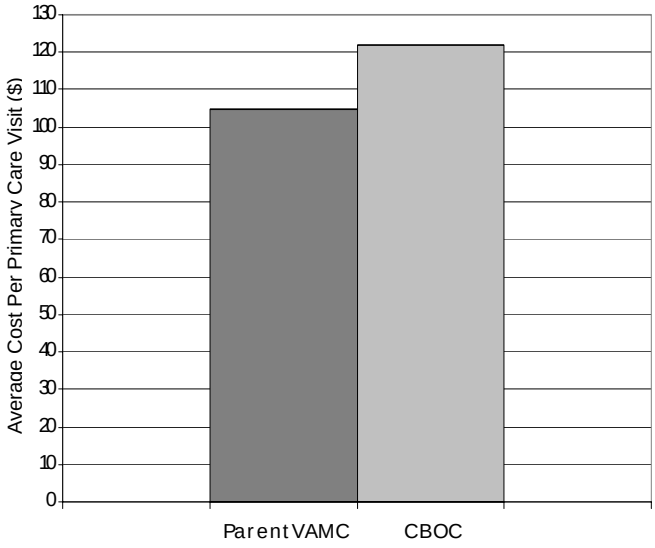
[11] Patients with service-connected conditions rated 30 percent or higher (priority levels 1and 2) were defined as "high priority" and all other veterans were defined as "low priority."

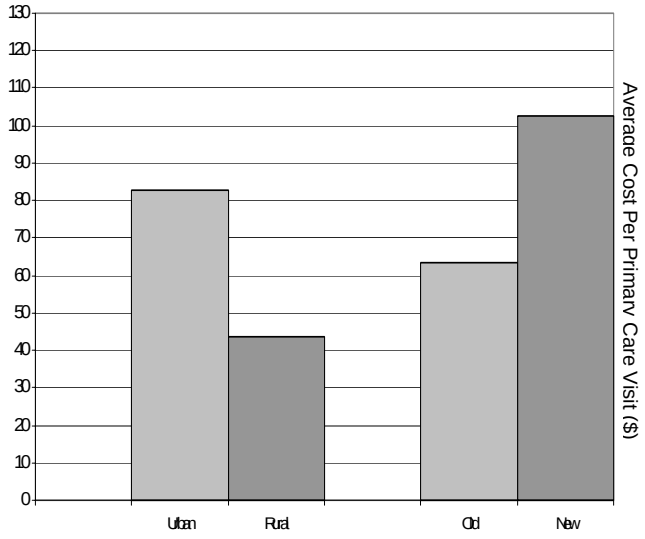
[12] Patients were categorized by user status as an "old user" or "new user" based on inpatient and outpatient utilization data. Patients with visits or admissions in FY95, FY96, and FY97 were defined as old VA patients or "old users," and patients with visits or admissions only in FY98 were defined as new VA patients or "new users."

Cost 1: Average Direct Cost Per Primary Care Visit, 4/1/98-9/30/98, Case-mix Adjusted

VA-staffed CBOC patients had a significantly higher cost per primary care visit than VAMC patients ($p < 0.001$) (Figure 1). CBOC patients also had a significantly higher cost per primary care visit at urban CBOCs compared to rural CBOCs ($p < 0.001$) (Figure 2). Finally, CBOCs established in FY98 had significantly higher cost per primary care visit when compared to CBOCs established before FY98 ($p < 0.001$). All of these comparisons were adjusted for case-mix differences. Due to the small number of VA-staffed CBOCs and VAMCs in the sample, cost comparisons at the VISN level were not made.



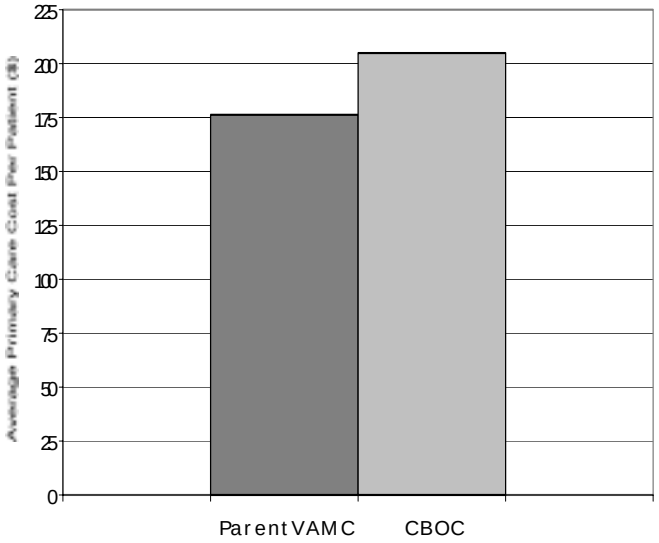
1. Comparison of Average Cost Per Primary Care Visit for CBOC Patients and Parent VAMC Patients



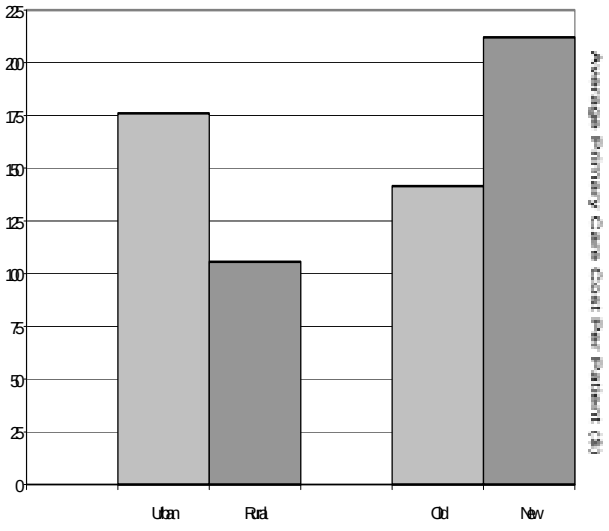
2. Comparison of Average Cost Per Primary Care Visit for CBOC Patients and Parent VAMC Patients, by CBOC Type

Cost 2: Average Primary Care Direct Cost Per Patient, 4/1/98-9/30/98, Case-mix Adjusted

CBOC patients had a significantly higher primary care cost per patient than VAMC patients ($p < 0.05$). This was true for VA-staffed CBOC patients only, since Contract CBOC patients were excluded (Figure 1). CBOC patients also had a significantly higher primary care cost per patient at urban CBOCs compared to rural CBOCs ($p < 0.001$) (Figure 2). Finally, CBOCs established in FY98 had significantly higher primary care cost per patient when compared to CBOCs established before FY98 ($p < 0.001$). All of these comparisons were adjusted for case-mix differences. Due to the small number of VA-staffed CBOCs and VAMCs in the sample, cost comparisons at the VISN level were not made.



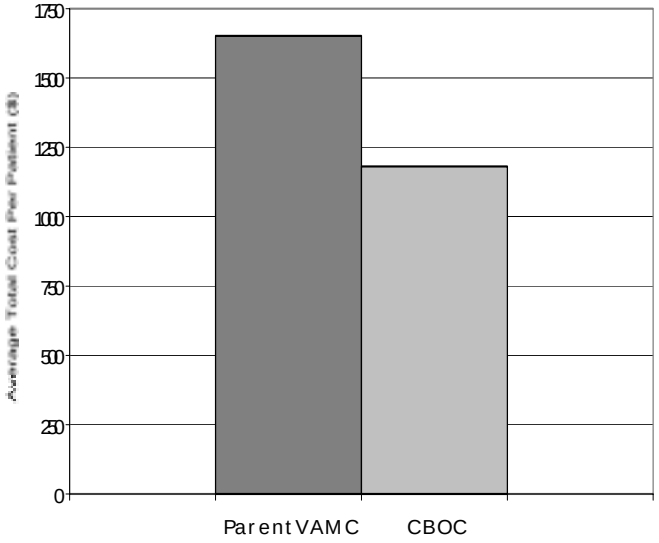
1. Comparison of Average Primary Care Cost Per Patient for CBOC Patients and Parent VAMC Patients



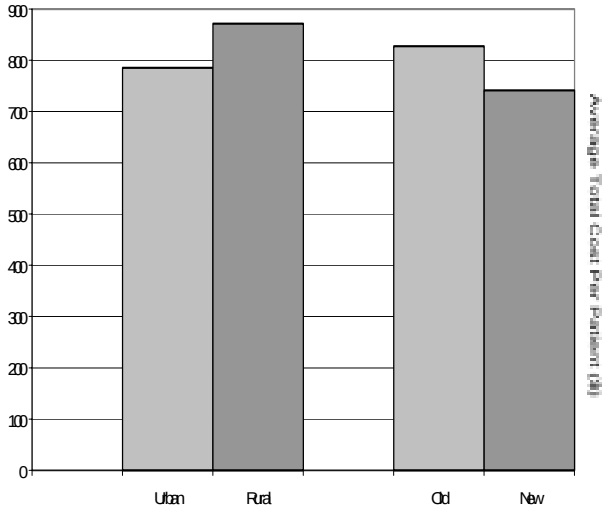
2. Comparison of Average Primary Care Cost Per Patient, CBOC Patients and Parent VAMC Patients, by CBOC Type

Cost 3: Average Total Direct Cost Per Patient, 4/1/98-9/30/98, Case-mix Adjusted

CBOC patients had a significantly lower total cost per patient for all care than VAMC patients ($p < 0.001$). This was true for VA-staffed CBOC patients only, since Contract CBOC patients were excluded (Figure 1). CBOC patients did not differ in total cost per patient from urban CBOC patients (Figure 2). Finally, CBOCs established in FY98 did not differ in total cost per patient when compared to CBOCs established before FY98. All of these comparisons were adjusted for case-mix differences. Due to the small number of VA-staffed CBOCs and VAMCs in the sample, cost comparisons at the VISN level were not made.



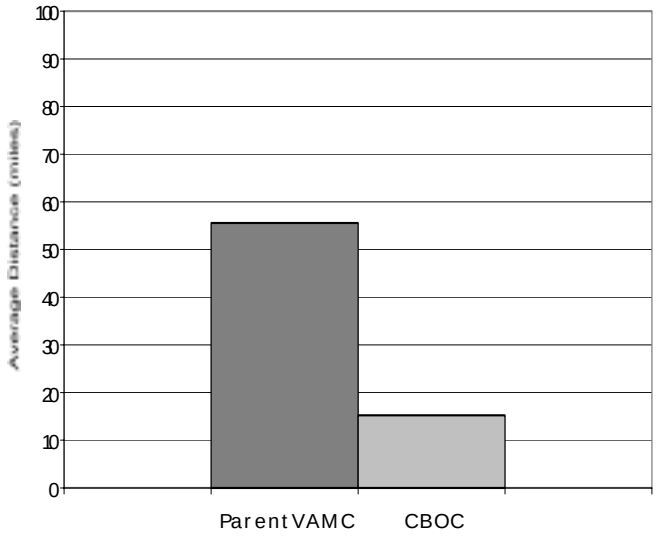
1. Comparison of Average Total Cost Per Patient for CBOC Patients and Parent VAMC Patients



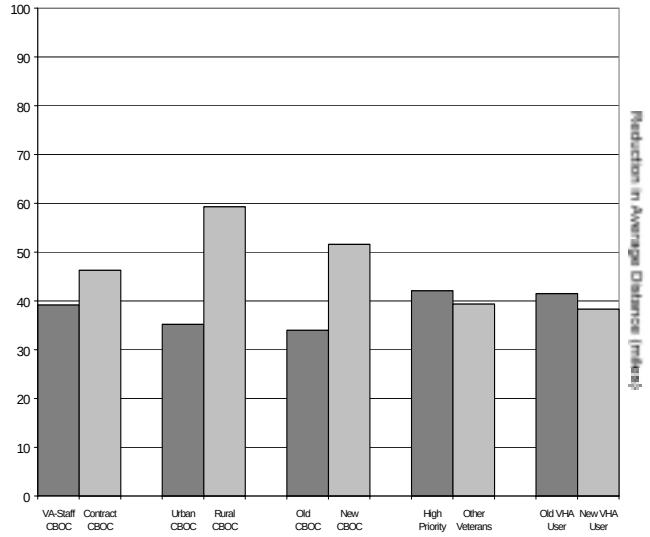
2. Comparison of Average Total Cost Per Patient for CBOC Patients and Parent VAMC Patients, by CBOC Type

Access 1: Average Travel Distance for CBOC Patients (in Different Priority and User Categories) to the CBOCs vs the Parent VAMCs

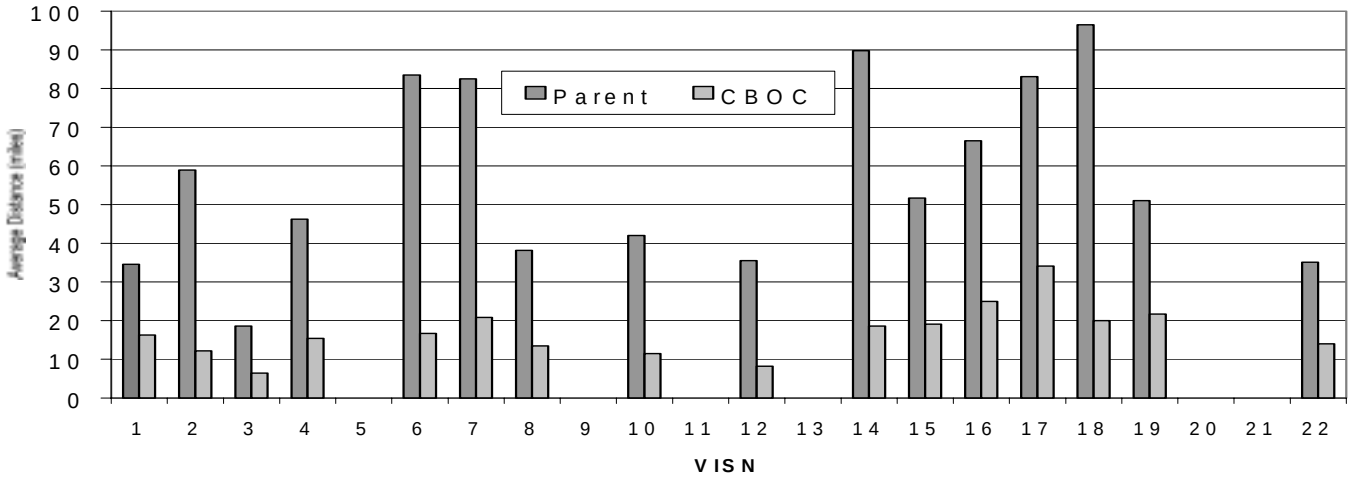
CBOC patients had a significantly shorter average estimated travel distance to the CBOCs than to the affiliated Parent VAMCs ($p < 0.001$). This was true for CBOC patients overall (Figure 1) and in all VISNs in the study (Figure 3). CBOC patients also had a significantly greater reduction in estimated travel distance at Contract CBOCs compared to VA-staffed CBOCs, at rural CBOCs compared to urban CBOCs, and at CBOCs established in FY98 compared to CBOCs established before FY98 ($p < 0.001$) (Figure 2). High priority veterans at the CBOCs had a slightly greater reduction in travel distance than low priority veterans, and old VA users had a slightly greater reduction in travel distance than new VA users ($p < 0.001$) (Figure 2).



1. Comparison of Average Estimated Travel Distance for CBOC Patients to CBOCs vs Parent VAMCs



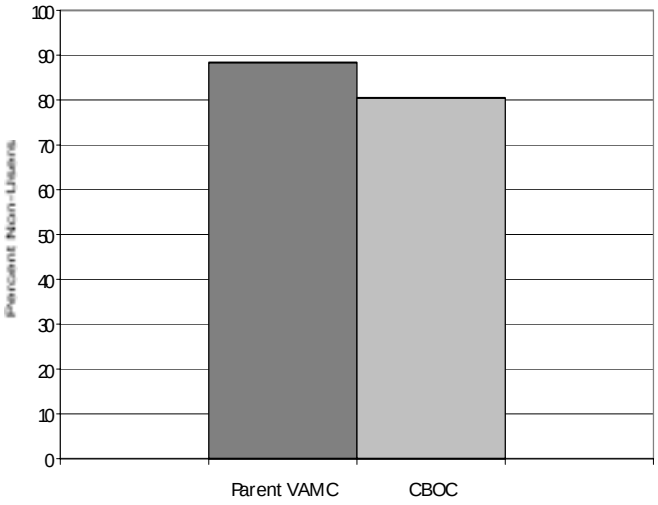
2. Reduction in Average Estimated Travel Distance for CBOC Patients to CBOCs vs Parent VAMCs, by Characteristics



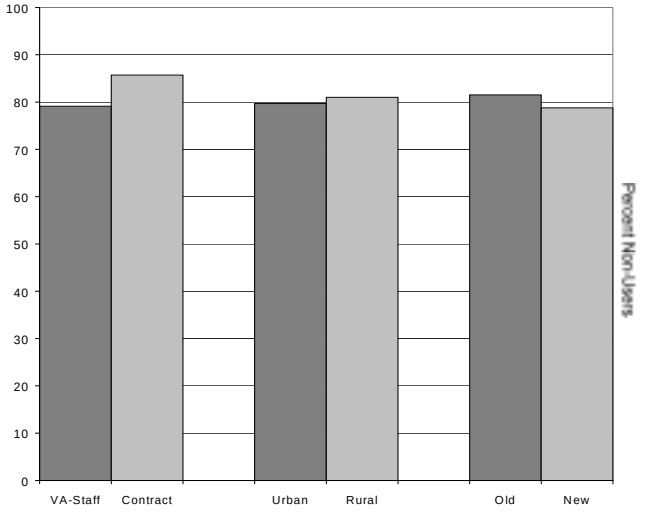
3. Comparison of Average Estimated Travel Distance for CBOC Patients to CBOCs vs Parent VAMCs, by VISN
Note that VISN level comparisons are valid only within VISNs (not across VISNs)

Access 5: Percent of Priority 1 and 2 Veterans Not Using VA Primary Care and Residing Within 30 Miles or 31-60 Miles of a VA Facility

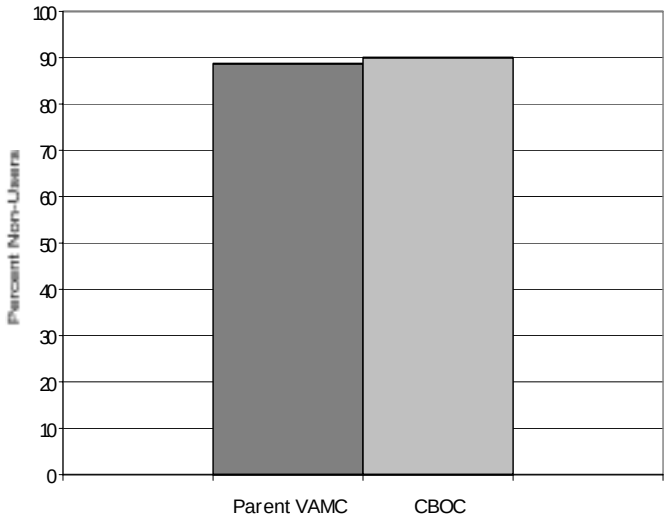
The percent of Priority 1 and 2 veterans (service-connected conditions rated 30% or higher) who were not using VA primary care services was significantly lower for veterans residing within 30 miles of the CBOCs compared to veterans residing within 30 miles of the Parent VAMCs ($p < 0.001$) (Figure 1). There were no significant differences in the comparisons of CBOCs by characteristics (Figure 2). Likewise, there were no significant differences in comparisons at 31 to 60 miles from the CBOCs or Parent VAMCs in the aggregate analysis or the between-CBOC analyses (Figures 3 and 4). There was an insufficient number of CBOCs and Parent VAMCs to perform separate within-VISN comparisons.



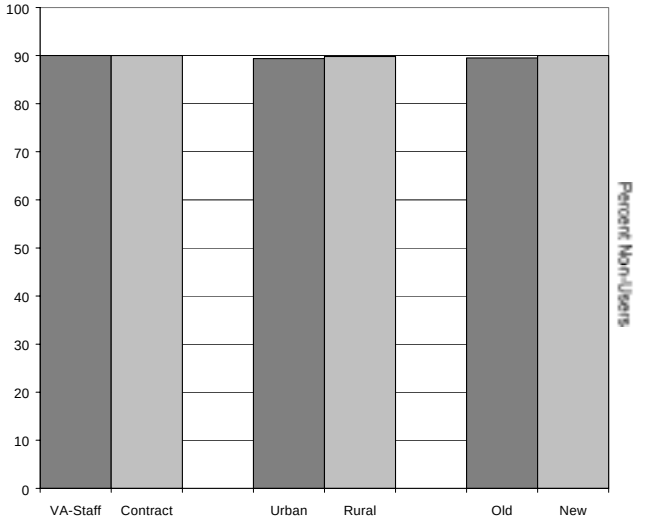
1. Comparison of Non-Users within 30 Miles who were Priority 1 & 2 Veterans, CBOCs vs Parent VAMCs



2. Comparison of Non-Users within 30 Miles who were Priority 1 & 2 Veterans, CBOC Characteristics



3. Comparison of Non-Users within 31 to 60 Miles who were Priority 1 & 2 Veterans, CBOCs vs Parent VAMCs



4. Comparison of Non-Users w/within 31 to 60 Miles who were Priority 1 & 2 Veterans, CBOC Characteristic

DISCUSSION

Cost Measures

Comparison of VA-staffed CBOCs vs Parent VAMCs

Average direct cost per primary care visit, average primary care direct cost per patient, and total direct cost per patient for CBOC patients and patients seen in Parent VAMC primary care clinics were compared for the last two quarters of fiscal year 1998 (4/1/98-9/30/98). All cost comparisons were based upon multivariate regressions comparing the same average patient in both settings.

Patients in VA-staffed CBOCs had higher average direct cost per primary care visit and primary care direct cost per patient than VAMC patients. The higher direct cost per primary care visit for VA-staffed CBOC patients may have been due to CBOC providers practicing more resource intensive care, since they are less likely to have onsite specialty care, ancillary care, and emergency care.[13] In fact, VAMC patients did receive more ancillary care which might have been due, in part, to the onsite access of these clinics at VAMCs. CBOC providers may also provide a greater range or different set of services to their patients than VAMC providers, because their patients would have to incur travel costs and extra waiting time to obtain additional care at the VAMC that wouldn't otherwise be available at the CBOC. It is also possible that CBOC patients had longer visits, on average, than patients seen in VAMC primary care clinics. Another possibility is that we did not perfectly control for demographic and other differences, so that CBOC patients were in worse health than VAMC patients in ways that we could not observe or had higher pent-up demand for care. According to Performance Report 1,[14] a greater percentage of CBOC patients were new to the VA system and these patients might have needed initial physical examinations and medical histories associated with initiating care with a new provider.

This finding of higher primary care costs is not surprising, given the improved access and convenience of primary care at CBOCs. The higher total primary care direct cost per patient was due to a combination of the higher cost per primary care visit and the higher average number of primary care clinic visits by CBOC patients, as reported in Performance Report 1. Despite this higher cost per primary care visit and per patient, CBOC patients had lower total care costs per patient, which means that the higher primary care costs for CBOC patients were offset by lower ancillary care costs for these patients.[15]

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[13] Note that the comprehensiveness of care in terms of ancillary services was reported separately, because there is no way to attribute ancillary services to the appropriate primary or specialty care encounter in the DSS Outpatient National Extract if a patient has multiple clinic stops or obtained these services within days of an earlier visit. To avoid errors of omission or commission, ancillary care costs were considered as a separate cost category and primary care costs refer only to provider and supply costs provided during the primary care visit.

[14] CBOC Performance Evaluation. *Performance Report 1: Measures Based on Austin Automation Center and Patient Survey Data.* HSR&D Management Decision and Research Center. Department of Veterans Affairs. July 1999.

[15] Costs for CBOC and VAMC were: $91.01 vs. $463.46 ($p<0.01$) for ancillary care; lower but not significantly different specialty and inpatient costs for CBOC patients. See Table 1 in Appendix B.

Without evidence of patient outcomes, it is difficult to know if this greater primary care cost was associated with improved health for CBOC patients. The lower total direct costs for CBOC patients may be due to some combination of four factors: the physical separation of CBOC primary care and VAMC specialty clinics, additional procedural requirements for specialist referrals,[16] their better unmeasured general health, and, possibly, CBOC patients using non-VA services for a larger portion of their total care.

As DSS cost data become available for more CBOCs and improve over time, it would be useful to confirm these results with an analysis that uses patient-level data on a larger sample of patients and includes Contract CBOCs. The results from this first analysis on a small sample of VA-staffed CBOCs and parent VAMCs indicate that CBOCs may be a promising approach to increase the number of veteran users while containing overall costs if startup costs are not excessive and if lower ancillary, specialty, and inpatient costs can be supported in a larger sample of CBOCs.

Comparison by CBOC Characteristics

The direct cost per primary care visit was higher for urban CBOC patients than for rural CBOC patients when patient demographic differences were controlled. It is possible that urban CBOC providers practiced a more resource intensive style of care, because they may have used more inputs or more expensive inputs. Urban CBOC providers probably have higher salaries than providers in rural CBOCs which would increase the average direct cost per primary care visit. In addition, urban CBOC patients may have been less healthy in ways that we could not observe and control. The average primary care direct cost per patient was also higher for urban CBOC patients, due primarily to the higher cost per visit.

Finally, overall direct costs for patients in urban CBOCs and rural CBOCs were similar Specialty care costs for patients in urban CBOCs were lower, but inpatient costs were higher.[17] It appears that a primary care orientation substitutes care away from specialty settings in urban, VA-staffed CBOCs and away from inpatient settings in rural, VA-staffed CBOCs.

Costs for patients seen in new CBOCs were also compared to costs for patients seen in old CBOCs. Direct cost per primary care visit for patients in new CBOCs was higher than a similar visit for the average patient in old CBOCs. Providers in new CBOCs may be providing more resource intensive primary care than providers in old CBOCs. Higher direct cost per primary care visit may be associated with longer visits to obtain initial physical examinations and medical histories of patients initiating care in new CBOCs. Alternatively, providers in new CBOCs may not have yet coordinated care with providers at the VAMC and are providing a greater range of services as a result. Finally, new CBOCs may have higher initial staffing levels as they determine the optimal physician workload level and a high staffing level would result in higher average direct costs per primary care visit. The average primary care direct cost per patient was

[16] CBOC patients don't have the convenience of obtaining a walk-in visit at another VAMC clinic as patients seen in the VAMC do, but must make an appointment.

[17] Costs for urban CBOC and rural CBOC patients were: \$194.26 vs. \$385.52 ($p<0.01$) for specialty care, \$201.26 vs. \$126.85 ($p<0.10$) for inpatient care, insignificant difference in ancillary costs. See Table 2 in Appendix B.

also higher for patients in new CBOCs than for patients in old CBOCs, even though the visit rate was lower for patients in new CBOCs. This is probably due to the higher direct cost per primary care visit.

Patients in new CBOCs and old CBOCs had similar total direct costs. Specialty care costs for patients in new CBOCs was lower than for patients in old CBOCs.[18] Specialty care costs may have been lower because providers in new CBOCs have not developed stable coordination and continuity of care and therefore referred patients less frequently to VAMCs than providers in old CBOCs. Providers in old CBOCs may have developed better integration with their affiliated VAMC and referred patients more regularly. Inpatient costs for patients in old CBOCs were lower than costs for patients in new CBOCs.

Issues in Cost Analysis of Contract CBOCs

The exclusion of Contract CBOCs from analysis of the three cost measures above was necessary for three reasons. There was only a small number of Contract CBOCs that were open by the second two quarters of FY98, that were tracked separately in DSS by their affiliated VAMCs, and that had enrolled significant number of veterans. Twenty-six Contract CBOCs were seeing patients on or before April 1, 1998, the first day of the six-month time period used to calculate costs. Only three Contract CBOCs met all of these criteria, as well as the requirement of having data in the DSS National Extracts that looked reasonable. Finally, direct cost comparisons with VA-staffed CBOCs were not possible because all indirect costs could not be excluded from Contract CBOC costs. Contract CBOCs are paid by capitation on a per member per year basis, which implicitly includes some amount for indirect costs to the CBOC. Comparisons using direct costs only are not possible because of this bundled payment that includes direct and indirect costs.

The average direct cost per primary care visit, average primary care direct cost per patient, and average total direct cost per patient are presented for the three Contract CBOCs that met these criteria and their affiliated VAMCs to provide a general sense of costs on a per visit and per patient basis (see Table 1 below).[19] Average direct cost per primary care visit at Contract CBOCs is driven by the capitation payment and actual number of veterans seen at each CBOC. For example, if a CBOC paid a contracted clinic a capitation payment based on an expectation that 300 veterans would enroll but only 75 veterans enroll, the average primary care cost per visit and per patient would be four times larger than was expected. Contract CBOCs are not required to refund payments if the expected number of veterans exceeds the actual number.

[18] Costs for new CBOC and old CBOC patients were: $96.62 vs. $287.88 ($p<0.01$) for specialty care, $239.26 vs. $164.84 ($p<0.10$) for inpatient care, insignificant difference in ancillary care costs. See Table 3 in Appendix B.

[19] While cost comparisons of VA-Staffed CBOCs and Contract CBOCs was not feasible, utilization analyses from Report 1 indicated that Contract CBOC patients had fewer primary care stops, fewer specialty care stops, and were less likely to receive a mental health diagnosis.

Table 1. Actual DSS Direct Costs for Patients in Contract CBOCs, 4/1/98-9/30/98

	Cost Per Primary Care Visit		Primary Care Cost Per Patient		Total Cost Per Patient	
	CBOC	*Parent*	*CBOC*	*Parent*	*CBOC*	*Parent*
CBOC 1	$70.76	$47.89	$85.26	$100.88	$325.82	$1600.03
CBOC 2	$11.63	$69.52	$37.65	$147.43	$614.77	$1026.17
CBOC 3	$275.57	$76.69	$699.77	$160.15	$1177.14	$1232.54

The three Contract CBOCs were geographically dispersed - New England (1), West Coast (2), and South (3) - and fairly large in size. These CBOCs provided care to an average of 473 patients, ranging from 368 to 565, with an average of 1147 visits. As can be seen in Table 1, while the cost per visit ($70.76) for Contract CBOC #1 is within the range of the cost per visit at the Parent VAMCs ($47.89 - $76.69), the other two CBOCs have costs that are considerably below or considerably above that range. These cost estimates are therefore suspect. The high average cost per visit in CBOC #3 ($275.57) was due to a lower number of enrolled veterans and visits than was expected. The actual and expected number of visits did not differ greatly at CBOC #2. We have not be able to determine why CBOC #2 had such a low cost per visit. Since cost per visit is a primary component of primary care cost per patient and total cost per patient, these latter two cost measures are also suspect and we cannot draw any conclusions regarding the cost of Contract CBOCs from these data.

Several lessons can be taken from these case studies. First, the quality of DSS data for Contract (and all VAMC clinics) depends directly upon accurate accounting of utilization in ViSTA and workload in the Financial Management System (FMS). DSS will ultimately only be as good as the data entered into these two systems, which are the data sources for DSS. Second, for contract organizations (e.g., Contract CBOCs) that do not have shared computer networks with the VAMC, careful tracking of workload and patient volume is critical. If these organizations are not connected to ViSTA, then workload and volume has to be recorded manually, submitted to the VAMC, and entered manually, which could result in reporting errors at any and all steps. Third, administrators responsible for Contract CBOCs should commit resources to generate reliable estimates of the number of veterans expected to enroll in a CBOC to minimize over- or under-funding, which is a challenging task. Fourth, DSS data used in any cost calculations using Contract CBOCs must be reviewed carefully for validity and consistency with other sites. Given the capitated payment for these facilities which are fixed at a per member per year rate, per visit and per patient costs are essentially unit costs that vary by utilization but not resource intensity. In addition, indirect costs cannot be broken out. Contract CBOCs should be explored in greater detail given the complexities in estimating costs for these facilities.

Summary of Cost Measures

For the comparisons of the three groups (CBOC/VAMC, urban/rural CBOC, new/old CBOC) presented here, higher primary care costs on a per visit and per patient basis were found and CBOC patients had lower total costs than VAMC patients. It must be noted that the estimates for patients in new CBOCs and rural CBOCs are based on a small number of total facilities. In addition, there is an ordering in the primary and specialty care costs in these comparisons. For example, primary care costs for new CBOC patients were greater than for old CBOC patients

and primary care costs for CBOC patients were greater than for VAMC patients. Conversely, specialty care costs for new CBOC patients were lower than for old CBOC patients which were, in turn, lower than for VAMC patients. There are two possible explanations for these trends. First, patients may be sorting themselves into the various facilities over time, so that new CBOCs have the healthiest patients and VAMC primary care clinics have the least healthy patients. As CBOCs age, unhealthy patients who need specialty care may migrate to the VAMC and some healthy veterans migrate to the CBOC. It is unlikely that we controlled for all case-mix differences. Alternatively, providers at new CBOCs may practice an "independent" or comprehensive primary care style and have less integration with the VAMC. As a result, they are the locus of the veteran's care initially. As the CBOC ages, the providers may become more integrated and coordinated with the VAMC and provide less primary care and more referrals to the VAMC. Either of these pathways are plausible and future research should track a cohort of veterans over time to explore the dynamics of patient and provider behavior and the cost implications.

Access Measures

Comparison of CBOCs vs Parent VAMCs

The two access performance measures presented in this report suggest that CBOCs have been situated so as to significantly improve geographic access for veterans. An important objective for establishing CBOCs was to reduce travel distance and travel time to primary care.[20, 21] The analysis found that CBOC patients in the study had a substantially shorter average estimated one-way travel distance from their residences to the CBOCs (15 miles) than to the affiliated Parent VAMCs (56 miles). It should be noted that the Parent VAMC may not be the closest non-CBOC VA facility for every CBOC patient, thus this analysis may overestimate improvement in access for some patients.

In addition, 69% of CBOC patients resided within 15 miles of the CBOCs whereas only 14% resided within 15 miles of the Parent VAMCs; and only 12% of CBOC patients resided more than 30 miles from the CBOCs whereas over 70% resided more than 30 miles from the Parent VAMCs. Even though the average travel time was unknown, it can be assumed that the majority of patients residing within 15 miles of the CBOCs or Parent VAMCs had a travel time of 30 minutes or less.[22] This suggests that a substantial percentage of CBOC patients have gained 'reasonable access' to primary care by traveling to CBOCs rather than Parent VAMCs.[23] Moreover, CBOC patients categorized as both high and low priority veterans[24] as well as old and

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20 *VHA Directive 97-036.* See References.

21 *GAO/HEHS 98-116.* See References.

22 A recent study found a conversion rate of 1.75 minutes per one mile straight-line distance. Fortney J, Rost K, and Warren J. Comparing Alternative Methods of Measuring Geographic Access to Health Services. *Health Services and Outcomes Research Methodology* (in press).

23 VHA uses a 30-minute travel standard to define 'reasonable access' to VHA primary care. Veterans traveling greater than 30 minutes have been considered 'historically underserved'. *GAO/HEHS 98-116;* p 3, 7, 14. See References.

24 Patients with service-connected conditions rated 30 percent or higher (priority levels 1 and 2) were defined as "high priority" and all other veterans were defined as "low priority."

new VA users[25] all had improved access with an average reduction of approximately 40 miles one-way travel distance to CBOCs compared to Parent VAMCs. There was no meaningful difference between these different veteran categories in the average distance saved traveling to CBOCs compared to Parent VAMCs.

Another important finding is that there was a lower percent of high priority veterans not using VA primary care who were residing within 30 miles of the CBOCs than within 30 miles of the Parent VAMCs. There was no difference at 31 to 60 miles. One interpretation is that CBOCs have improved geographic access and increased VA primary care utilization for high priority veterans within their catchment areas who otherwise may have remained non-users. The CBOCs in the analysis were an average distance of 57 miles from the Parent VAMCs. Thus, the majority of veterans in the study who had 'reasonable access' to a CBOC did not have 'reasonable access' to the affiliated Parent VAMC.[26]

Comparison of CBOC Characteristics

The Access measure for estimated travel distance found that CBOC patients receiving care at urban, rural, old, new, VA-staffed, and Contract CBOCs all had a substantial reduction in estimated one-way travel distance to the CBOCs compared to the affiliated Parent VAMCs. However, the patients at rural, new, and Contract CBOCs had a significantly greater reduction in average estimated travel distance. This is not surprising since rural, new, and Contract CBOCs are on average further from the Parent VAMCs than urban, old, and VA-staffed CBOCs. In contrast, for the other Access measure in this report, there was no significant difference in the percent of high priority veterans who were non-VA users residing within 30 miles or 31 to 60 miles of Contract vs VA-staffed CBOCs, rural vs urban CBOCs, or new vs old CBOCs.

Summary

When the Access and Cost measures examined in this report are considered in conjunction with the performance measures presented in Performance Report 1, CBOCs appear to generate greater access to care and lower total cost per patient compared to the affiliated Parent VAMCs, as well as greater satisfaction and lower utilization of specialty care. Although the limitations of these baseline analyses and the small sample size limit the generalizability of the results, these performance measures suggest that CBOCs are a valid and promising approach for providing primary care to veterans.

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[25] Patients were categorized by user status as an "old user" or "new user" based on inpatient and outpatient utilization data. Patients with visits or admissions in FY95, FY96, and FY97 were defined as old VA patients or "old users," and patients with visits or admissions in only in FY98 were defined as new VA patients or "new users."

[26] VHA uses a 30-minute travel standard to define 'reasonable access' to VHA primary care. Veterans traveling greater than 30 minutes have been considered 'historically underserved'. *GAO/HEHS 98-116;* p 3, 7, 14. See References.

OTHER CBOC EVALUATION PROJECT REPORTS

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Finally, we recognize the efforts of Alice Birnbaum and Molly Bradshaw for data collection, data quality checks, and data management.

APPENDIX A

Methods

I. Cost Measures

The cost measures that were constructed for this report were average direct cost per primary care visit, average primary care direct cost per patient (SSN), and average total VA health care direct cost per patient. Primary care costs refer to provider and supply costs only, because costs for ancillary services were considered separately and indirect costs for overhead, engineering, and other costs that support patient care were excluded. The definitions for each cost measure are:

Cost 1: Average direct cost per primary care visit. The source of this measure is VHA Directive 97-036 CBOC Objective #8: "Reduce the operating cost of providing care; i.e., provide care to existing patients at a lower cost by providing it in a community ambulatory care setting rather than a hospital-based clinic." This measure was calculated by taking the ratio of the total primary care direct costs and total primary care visits for each patient in the sample. The numerator of costs and the denominator of visits were both generated from DSS administrative data. For CBOC patients, the ratio included costs and visits at the VAMC primary care clinics (primary care, general internal medicine, women's health, and geriatrics) and the CBOC, because CBOC-specific care could not be differentiated from VAMC-specific care due to the absence of substation numbers in the DSS cost data. Therefore, the cost per primary care visit for CBOC patients includes both CBOC and VAMC visits and it is not a cost per primary care visit solely at the CBOC.[27] However, because of the low use of Parent VAMC primary care by CBOC patients, the CBOC cost estimates should not be unduly influenced by this problem. For VAMC patients, the ratio includes only costs and visits at the VAMC primary care clinics. Direct cost data was generated from the 1998 DSS Outpatient National Extract.

Cost 2: Average primary care direct cost per patient. This measure was calculated by aggregating the direct, non-ancillary cost of primary care visits for each CBOC and VAMC patient in the sample. Direct cost data for this cost measure was also generated from the 1998 DSS Outpatient National Extract.

Cost 3: Average total direct cost per patient. This measure was calculated by aggregating direct costs for all outpatient and inpatient encounters for each patient in our sample. The four types of encounters include primary care, specialty care, ancillary and other care, and inpatient care. Total cost data were generated from the 1998 DSS Outpatient and Inpatient National Extracts.

Selection of CBOCs

[27] According to Performance Report 1, only 14.1% of veterans classified as CBOC patients also had at least one stop at the primary care clinic of the Parent VAMC during the study period, and only 3.1% had more primary care stops at the Parent VAMC than the CBOC. The results of the cost performance measures should not be sensitive to this mis-attribution problem.

VA-staffed CBOCs were chosen in a two-step process, driven largely by the need to identify sites with reliable Decision Support System (DSS) cost data. In the first step, we identified which of the 139 CBOCs that were surveyed in the first stage of this project might have reliable and stable DSS data on a sizable sample of veterans using two criteria. The first inclusion criterion was that each CBOC had to have at least 500 visits in fiscal year 1998 (FY98). This criterion excluded CBOCs that might generate unreliable costs due to small samples. The second criterion was that the CBOCs had to be open prior to the second half of FY98. These criteria were used in the previous performance measures in Performance Report 1.[28] Using these criteria in this Report ensures consistency in the inclusion criteria and samples across reports.

The second step was to merge the patients in the facilities that met the two criteria of this first step with the source of cost data, the DSS National Extracts (see next section for a detailed discussion of DSS data). Several CBOCs and VAMCs were lost in this merge, for two reasons. First, some facilities did not have cost data reported in the DSS National Extracts and could not be included. Second, two VA-staffed CBOCs were excluded because their cost per visit and cost per patient estimates from the DSS National Extracts were unreasonably low (e.g., $1.40 per visit). Including patients from these CBOCs would have biased the cost estimates downward and were excluded to avoid this bias. Finally, patients seen in Contract CBOCs were included in this sample, but were eventually excluded due to uncertain validity of CBOC cost data for these patients. This final exclusion criterion resulted in a final sample of 18 VA-staffed CBOCs that met all criteria and are the basis for the cost analyses presented here. This second step reduces our final sample size to 8,227 patients in 18 VA-staffed CBOCs and 131,051 patients in eight VAMCs, which represent a subset of the CBOCs and VAMCs evaluated in Performance Report 1.

Sample Generation

The sample for this study included patients in the subset of CBOCs and parent VAMC primary care clinics and was generated from an administrative dataset at the Austin Automation Center under the guidance of Dr. John Fortney. VA-staffed CBOC and Parent VAMC patients were identified from the Austin Outpatient Care File by stop code and visit date.

Patients treated at the primary care clinics (primary care, general internal medicine, geriatrics, women's health) of the Parent VAMCs in the last six months of fiscal year 1998 are included in the statistical analysis as the comparison group. The final sample from Parent VAMC primary care clinics included 131,051 patients. Any veteran treated at both a VA-staffed CBOC and the primary care clinic at a Parent VAMC during the last six months of fiscal year 1998 was considered to be a CBOC patient, and thus, the two samples of patients are mutually exclusive. The sample from VA-staffed CBOCs included 8,227 patients. In all cost comparisons, the patient was the unit of analysis. Table 1 below presents the characteristics of patients in the VA-staffed CBOCs and Parent VAMC primary care clinics. As can be seen in the table, VA-staffed CBOCs had patients with a lower level of service connection and older patients, on average, than

[28] CBOC Performance Evaluation. *Performance Report 1: Measures Based on Austin Automation Center and Patient Survey Data.* HSR&D Management Decision and Research Center. Department of Veterans Affairs. July 1999.

the VAMCs. A greater percentage of VAMC patients were unmarried and African American or Hispanic.

Table 1. Characteristics of Patients in CBOCs and Parent VAMC Primary Care Clinics

Characteristic	CBOCs	Parent VAMC Clinics
Age	64.4 years	60.8 years
Female Gender	2.4%	1.8%
Caucasian	56.1%	54.4%
African American	3.7%	9.8%
Hispanic	1.2%	2.8%
Unknown Ethnicity	38.7%	32.4%
Married	64.3%	52.9%
Percent Service Connected	11.7%	15.6%
Diagnosis Cost Group*	3.07	3.94
Sample Size	8,227	131,051

* Higher score equals sicker patients

For the subsample of 8,227 patients in 18 VA-staffed CBOCs, case-mix-adjusted analyses were also conducted to determine if costs varied by CBOC type. Specifically, the following comparisons were made: 1) rural versus urban CBOCs,[29] and 2) CBOCs established in FY98 (new) versus CBOCs established in FY95, FY96, or FY97 (old). There were 6,892 patients in 13 urban CBOCs and 1,335 patients in five rural CBOCs.[30] There were 2,692 patients in six new CBOCs and 5,535 patients in twelve old CBOCs.[31] CBOC establishment date was obtained from a survey of VISNs administered by the CBOC Performance Evaluation Project. Table 2 presents the characteristics of patients in the 18 VA-staffed CBOCs.

Table 2. Characteristics of Patients in Urban/Rural CBOCs and New/Old CBOCs

Characteristic	Urban	Rural	New	Old
Age	64.9 years	61.8 years	67.6 years	63.0 years
Female Gender	2.2%	1.5%	1.4%	2.9%
Caucasian	51.6%	79.6%	64.3%	52.1%
African American	4.0%	2.2%	1.9%	4.7%
Hispanic	1.1%	1.7%	0.4%	1.6%
Unknown Ethnicity	43.1%	16.2%	33.1%	41.4%
Married	64.3%	64.3%	67.6%	62.8%
Percent Service Connected	11.4%	13.1%	8.6%	13.2%
Diagnosis Related Group*	3.06	3.10	3.09	3.05
Sample Size	6,892	1,335	2,692	5,535

* Higher score equals sicker patients

[29] CBOCs were categorized as urban if located in an MSA county, and as rural if located in a non-MSA county.

[30] CBOCs were categorized as urban if located in an MSA county, and as rural if located in a non-MSA county.

[31] CBOCs were categorized as “old” or “new” based upon the date patients were first seen in a CBOC according to the VISN survey administered by the CBOC Performance Evaluation Project. CBOCs established in FY95, FY96 and FY97 were defined as "old" and CBOCs established in FY98 were defined as “new.”

Rural CBOCs had slightly lower percent of service-connected patients, fewer female patients and a lower average age, but a higher percent of Caucasian patients compared to urban CBOCs. Finally, new CBOCs had a much lower percent of service connected patients, but a higher average age and a higher percent of Caucasian patients and married patients than old CBOCs.

Extraction of Decision Support System Cost Data

Outpatient cost data were obtained from the 1998 Decision Support System (DSS) Outpatient National Extract and inpatient cost data were obtained from the 1998 DSS Inpatient National Extract for the period 4/1/98 to 9/30/98. The National Extracts had several considerable advantages over other methods of VA cost extraction. The ability to track the inpatient and outpatient costs of individual patients and the ability to match this patient-level data to other administrative datasets (e.g., risk adjustment data, demographics) was a clear advantage of the National Extracts. In addition, the ability to parse direct and indirect costs was an additional advantage, because we could generate stable cost estimates on clinically and policy relevant performance measures. Finally, the explicit inclusion of ancillary care costs in the analysis of total costs based on VA resources, as opposed to extrapolation using non-VA costs (e.g., Medicare fee schedules), provided a realistic sense of the relative magnitudes of resource use in our cost comparisons. There are several other approaches to collecting cost data, such as obtaining standardized DSS reports directly from each facility, extrapolating costs using Medicare or other non-VA sources, or using the CDR. For our purposes, these other approaches were inferior to the National Extracts because they lacked the specificity to separate patient-specific direct and indirect costs. They might be useful, however, in testing the internal and external validation of DSS costs in future studies.

Costs for every encounter in the DSS National Extracts are divided into surgical costs, laboratory costs, radiology costs, pharmacy costs, and all other costs. Clinic stops are also associated with every encounter and primary and specialty care were differentiated according to stop codes. All ancillary and other costs (laboratory, radiology, and pharmacy) were grouped without regard to stop codes to simplify the comparisons. Thus, primary care and specialty care costs exclude the cost of ancillary services provided at the time of these encounters. For inpatient encounters, direct costs for nursing bed days, surgical care, laboratory services, radiology services, pharmacy services, and all other care were grouped together using data from the DSS Inpatient National Extract.

These DSS extracts provided patient-level data for the fixed direct, variable direct, fixed indirect, and total cost in the clinic and facility in which a patient had an encounter. Direct costs refer to all costs directly associated with patient care, such as physician and nurse time. Fixed direct costs refer to the expense for inputs that are required for every patient encounter (e.g., nurse time for checking a patient in). Variable direct costs refer to expenses that vary with the length and intensity of a patient encounter (e.g., casting supplies, physician time). Fixed indirect costs refer to costs associated with activities that support patient care, such as administrative and janitorial services. Fixed and variable direct costs were summed to form the cost measures for every patient in our sample. Direct costs for primary care visits and primary care per patient represent only provider and supply costs, since ancillary services were considered separately and indirect

costs were excluded. Indirect costs were excluded from these analyses because of intra-division inconsistency and inter-division inconsistency. Intra-division inconsistency refers to the differences in indirect cost categories that were reported in a given CBOC and its affiliated VAMC primary care clinics. Inter-division inconsistency refers to differences in the indirect cost categories that were reported across facilities in our study. Since we were not able to obtain a standardized, consistent definition of indirect costs, these costs were excluded from the study.

Due to the format of the DSS Outpatient National Extract, outpatient encounters at the CBOC and primary care clinics at the VAMC could not be separated due to the absence of substation numbers in the National Extract. As a result, primary care for CBOC patients includes both CBOC-based care and VAMC-based care.

Validation of Decision Support System Cost Data

Since the cost comparisons are for VA-staffed CBOC patients and VAMC patients, urban/rural CBOC patients, and old CBOC/new CBOC patients, the validation work focused on the face validity of the direct cost estimates generated from the DSS National Extracts for these facilities. Based upon a facility-by-facility comparison of frequencies for cost per patient, patients in two VAMCs and their affiliated VA-staffed CBOCs were excluded because their primary care costs were unreasonably low. The direct cost per primary care visit, direct primary care costs, and total direct costs for the remaining 14 VAMCs and 18 VA-staffed CBOCs had face validity and remained in the final sample.

Statistical Analysis

The statistical analysis tests the hypothesis that the performance measure for VA-staffed CBOC patients is different than the performance measure for patients seen in the Parent VAMCs. To test this hypothesis for continuously distributed performance measures such as cost, a linear regression equation is specified. Due to the large sample size, statistically significant differences that are not financially or policy relevant may result.

The explanatory variable of interest is a dichotomous variable indicating whether the patient was treated by a CBOC or by the primary care clinic of a Parent VAMC. Several variables are included to control for observable case-mix differences between patients seen in CBOCs and Parent VAMCs. Case-mix adjustment is necessary because CBOC patients may, on average, be healthier (or sicker) than Parent VAMC patients. Available case-mix measures from AAC databases include age, gender, ethnicity, marital status, percent service connected, and Diagnosis Related Group (DRG). In addition, a dummy variable was specified for each facility in the sample to generate a fixed effects model to control for unobserved factors at each facility that might influence costs.

Among the subsample of patients seen at the 18 CBOCs, separate regression analyses were conducted to test the hypotheses that the performance measures were different in: 1) urban CBOC patients and rural CBOC patients, and 2) patients in new CBOCs (established in fiscal year 1998) and patients in old CBOCs (established in fiscal years 1995-1997). These two CBOC characteristics were obtained from the CBOC survey administered in the Fall of 1998 by the staff

of the CBOC Performance Evaluation Project. A cost comparison of Contract CBOC patients and VA-staffed CBOC patients was also initially examined, but uncertain validity of DSS cost data for Contract CBOCs required their exclusion. Again, linear regression equations were specified using the three cost measures in separate analyses. The explanatory variable of interest in the first CBOC analysis was a dichotomous variable indicating whether the patient was seen in an urban or rural CBOC. The explanatory variable of interest in the second CBOC analysis was a dichotomous variable indicating whether the patient was seen in a new or old CBOC. As in the CBOC/VAMC analysis, case-mix adjustment was done using covariates for age, gender, marital status, ethnicity, percent service connection, and Diagnosis Related Group (DRG). Fixed effects for unobserved facility characteristics were again included.

To generate estimated direct cost per primary care visit, direct primary care cost, and total direct costs, the expected value of each cost measure for CBOCs and Parent VAMCs was calculated using the regression parameter estimates and the case-mix factors of a typical veteran treated as an outpatient in FY98. This approach controlled for any observable case-mix and facility differences and generated an expected value of each cost measure for a typical patient in a CBOC and the same typical patient treated in a Parent VAMC primary care clinic. An average patient was defined using the mean values of all case-mix and facility predictors using all 139,278 patients seen in the 18 CBOCs and 14 VAMCs. In the case of dichotomous variables such as gender, the exact gender composition (e.g., 89% male or 0.89) was entered into each calculation, not the characteristic of the most common type of patient (e.g., male). The relative direct costs generated from these two calculations are presented graphically in the first part of Charts 1-3. Significant differences between CBOC patients and patients seen in Parent VAMCs are reported in the text accompanying the bar charts.

For the cost comparisons of different CBOCs, the expected values were calculated using the same methodology as above. In these comparisons, the values for the typical patient seen in CBOCs in general were used to generate expected values for each cost measure. The typical CBOC patient was defined by the mean value of all predictors in the CBOC analyses and the expected value of a typical CBOC patient seen in an urban CBOC was compared with the expected value of the same typical CBOC patient seen in a rural CBOC. A similar calculation was done for patients in new CBOCs and patients in old CBOCs. The relative direct costs generated from these two calculations are presented in the second part of Charts 1-3.

II. Access Measures

Access 1: Average travel distance for CBOC patients (in different priority and user categories) to the CBOCs vs the Parent VAMCs. This performance measure assesses whether CBOCs have improved geographic access for veterans receiving medical care at the CBOCs. The source of this measure is VHA Directive 97-036 CBOC Objective #3 & #11 and the General Accounting Office Report (GAO/HEHS 98-116). The VHA objective for CBOCs is to reduce the need to travel long distances to VA primary care by improving access for historically underserved veteran populations.[32] This performance measure was calculated by comparing the average

[32] VHA uses a 30-minute travel standard to define 'reasonable access' to VA primary care. Veterans traveling greater than 30 minutes have been considered 'historically underserved.' *GAO/HEHS 98-116*, p 3, 7, 14. See References.

distance traveled by CBOC patients to CBOCs vs Parent VAMCs. Average travel distance was estimated using AAC zip code data and straight-line distance between zip code centroids.[33] CBOC patients with service-connected conditions rated 30% or higher (priority levels 1 and 2) were defined as 'high priority' and all other veterans were defined as 'low priority.' CBOC patients with visits or admissions in FY95, FY96 or FY97 were defined as 'old' VA patients, and those with visits or admissions only in FY98 were defined as 'new' VA patients.

Sample Generation

CBOCs included in the analysis had at least one visit recorded in the Austin Automation Center (AAC)[34] Outpatient Encounter File prior to 4/1/98 and treated at least 50 patients between 5/15/98 and 7/15/98. These inclusion criteria, which were also used for the measures in Performance Report 1,[35] assured that the CBOCs treated a sufficiently large sample of patients to yield a stable measure of performance. Of the 139 CBOCs established between FY95 and the end of FY98, 38 met these inclusion criteria (see Appendix C). These 38 CBOCs were affiliated with 32 Parent VAMCs and located in 16 VISNs. The CBOCs included 30 VA-staffed and 8 Contract CBOCs, 25 urban and 13 rural CBOCs,[36] and 24 old and 14 new CBOCs.[37]

Veterans attending one of the 38 CBOCs were included in the analysis if they had an encounter at the CBOC during the second half of FY98 (i.e., 4/1/98 to 9/30/98), had a residential zip code in the AAC database that matched with a zip code file containing 1999 US Postal Service zip codes with latitude and longitude centroids,[38] and had a residential zip code within 300 miles of the CBOC and/or Parent VAMC. Veterans with a residential zip code greater that 300 miles from both the CBOC and Parent VAMC were excluded because of the likelihood that the residential zip code was miscoded or affiliated with a seasonal residence (e.g. a winter residence). Three hundred miles was used as a conservative cutoff since all zip codes in the continental US are within 260 miles of a VAMC. The 38 CBOCs in the study treated 37,084 veterans between 4/1/98 to 9/30/98, and 97.4 % or 36,137 veterans had zip code information compatible with the inclusion criteria.

Statistical Analysis

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33 The 1999 ZipList Geocode file has latitude and longitude fields that contain geographic coordinates in degrees of the "centroid" of the zip code area.

34 Clinical and administrative data routinely collected by each VAMC are compiled in a nationwide database housed at the Austin Automation Center (AAC).

35 CBOC Performance Evaluation. *Performance Report 1: Measures Based on Austin Automation Center and Patient Survey Data.* HSR&D Management Decision and Research Center. Department of Veterans Affairs. July 1999.

36 CBOCs were categorized as urban if located in an MSA county, and as rural if located in a non-MSA county.

37 CBOCs were categorized as "old" or "new" based upon the date patients were first seen in a CBOC according to the VISN survey administered by the CBOC Performance Evaluation Project. CBOCs established in FY95, FY96 and FY97 were defined as "old" and CBOCs established in FY98 were defined as "new."

38 The 1999 ZipList Geocode file has latitude and longitude fields that contain geographic coordinates in degrees of the "centroid" of the zip code area.

The zip codes for the 36,137 veterans' residences, the 38 CBOCs, and the 32 Parent VAMCs were converted into latitude and longitude centroids.[39] The distance from a veteran's residence to the CBOC where he/she received care and to the Parent VAMC were estimated using straight-line distance between the zip code centroids.

Comparisons of the average estimated distance traveled by CBOC patients to the Parent VAMC versus to the CBOC were made using the paired t-test. Because only one population was used in the comparison, i.e., CBOC patients, the two samples were not independent. Therefore, a regression model was not applicable for this analysis and case-mix adjustment was not needed. The estimated distance traveled was compared in a single aggregate comparison, and in separate within-VISN comparisons for each VISN in which the sample CBOCs were located.

Distance comparisons were also made between the following types of CBOCs and types of veterans: 1) VA-staffed versus Contract-staffed CBOCs, 2) urban versus rural CBOCs,[40] 3) old versus new CBOCs,[41] 4) high priority veterans versus low priority veterans,[42] and 5) old VA users vs new VA users.[43] For these analyses, the difference in average estimated distance traveled by CBOC patients to the Parent VAMCs minus the distance traveled to the CBOCs was compared across CBOC and veteran categories using independent samples t-tests. These statistical analyses tested the hypothesis that the difference in average distance was not equal across categories.

For the comparisons of distance to the CBOCs versus Parent VAMCs, and the distance between CBOC and veteran categories, differences at the $p<0.05$ level were considered statistically significant. For the VISN- level comparisons, differences at the $p<0.01$ level were considered significant because of large number of comparisons.

Access 5: Percent of priority 1 and 2 veterans not using VA primary care and residing within 30 miles or 31-60 miles of a VA facility. This performance measure assesses whether CBOCs have improved primary care access for service-connected veterans residing in close proximity to the CBOCs. The source of this measure is VHA Directive 97-036 CBOC Objective #3 & #11 and the General Accounting Office Report (GAO/HEHS 98-116). The VHA objective for CBOCs is to reduce the need to travel long distances to VA primary care by improving access

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[39] The 1999 ZipList Geocode file has latitude and longitude fields that contain geographic coordinates in degrees of the "centroid" of the zip code area.

[40] CBOCs were categorized as urban if located in an MSA county, and as rural if located in a non-MSA county.

[41] CBOCs were categorized as "old" or "new" based upon the date patients were first seen in a CBOC according to the VISN survey administered by the CBOC Performance Evaluation Project. CBOCs established in FY95, FY96 and FY97 were defined as "old" and CBOCs established in FY98 were defined as "new."

[42] Patients with service-connected conditions rated 30 percent or higher (priority levels 1 and 2) were defined as "high priority" and all other veterans were defined as "low priority."

[43] Patients were categorized by user status as an "old user" or "new user" based on inpatient and outpatient utilization data. Patients with visits or admissions in FY95, FY96, and FY97 were defined as old VA patients or "old users," and patients with visits or admissions in only in FY98 were defined as new VA patients or "new users."

for historically underserved veteran populations.[44] US zip code centroids[45] and data from the Planning Systems Support Group and AAC were used to calculate the percent of priority 1 and 2 veterans (service-connected conditions rated 30% or higher) who are non-VA users residing within 30 and 31-60 miles of the CBOCs and Parent VAMCs.

Sample Generation

To be included in the analysis, CBOCs had to have at least one visit recorded in the AAC Outpatient Encounter File prior to 4/1/98 and have treated at least 50 patients between 5/15/98 and 7/15/98. Thirty-eight CBOCs met these inclusion criteria (see Appendix C). These CBOCs were affiliated with 32 Parent VAMCs and located in 16 VISNs. All zip codes with geographic centroids within a 30 mile and 31-60 mile radius of each of the CBOCs and Parent VAMCs were identified. MapInfo and a zip code file containing 1999 US Postal Service zip codes with latitude and longitude centroids were used for the spatial analysis.

For this performance measure, the percent of Priority 1 and 2 veterans (service-connected conditions rated 30% or higher) that were not using VA primary care services in the last two quarters of FY98 was estimated from existing VA data sources. First, data from the Planning Systems Support Group were used to estimate the total number of Priority 1 and 2 veterans residing in zip codes within 30 and 31-60 miles of the study CBOCs or VAMCs during FY98. Second, AAC data were used to identify the number of Priority 1 and 2 veterans residing in zip codes located within 30 and 31-60 miles of the CBOCs or VAMCs who had a visit to a study CBOC or Parent VAMC primary care clinic during the second half of FY98 (i.e., 4/1/98 to 9/30/98). Third, the number of Priority 1 and 2 veterans residing in these zip codes who were not using VA primary care services was estimated by taking the difference between the two groups identified above, i.e., all veterans in these categories minus those actively using VA primary care services. These numbers were aggregated at the facility level to obtain the percent of Priority 1 and 2 veterans residing within 30 and 31-60 miles of each CBOC and VAMC who were not using VA primary care services.

Statistical Analysis

The mean percent of Priority 1 and 2 veterans not using VA primary care services and residing within 30 miles and 31-60 miles of the CBOCs versus the Parent VAMCs was compared using the paired t-test. The unit of analysis was at the facility level, i.e., CBOCs vs VAMCs. Additional analyses using independent samples t-tests compared the percent of Priority 1 and 2 non-users across types of CBOCs: 1) VA-staffed versus Contract CBOCs, 2) rural versus urban CBOCs, and 3) old versus new CBOCs. The sample size was insufficient to perform separate within-VISN comparisons between CBOCs and VAMCs.

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[44] VHA uses a 30-minute travel standard to define 'reasonable access' to VA primary care. Veterans traveling greater than 30 minutes have been considered 'historically underserved'. GAO/HEHS 98-116, p 3, 7, 14. See References.

[45] The 1999 ZipList Geocode file has latitude and longitude fields that contain geographic coordinates in degrees of the "centroid" of the zip code area.

These analyses tested the hypothesis that the percent of non-users was different between the CBOCs and Parent VAMCs, and between the CBOC categories. Differences at the $p<0.05$ level were considered statistically significant. Regression models with covariates for case-mix adjustment were not used in these analyses because demographic and health status data were not available for veterans not using VA services.

III. Limitations

There are several limitations in this study, including data validity issues in DSS cost data and generalizability of the results. Certain limitations refer only to the Access measures and other limitations refer only to the Cost measures.

For the Cost performance measures, the statistical comparison between CBOCs and their Parent VAMCs is subject to some important limitations. The first serious limitation was the uncertain validity of DSS cost data. The DSS Outpatient and Inpatient National Extracts used for the cost comparisons have not been validated with local DSS costs derived at each facility nor with the "true" costs of providing specific services to specific patients. In addition, costs for Contract CBOC patients had uncertain face validity because we could not validate direct cost per primary care visit from the DSS Outpatient National Extract and standardized, clinic-level DSS reports obtained from a handful of Contract CBOCs. As a result, patients in Contract CBOCs were excluded from these cost comparisons. To further reduce the extent of possible cost misattribution in the remaining sample of patients, indirect (overhead) costs were excluded so that all cost measures were based upon direct costs for patient care only. Costs for patients in a given VAMC and affiliated CBOC are likely to have direct costs calculated in a similar manner, so that it is assumed that there is internal consistency within division. Across-division consistency is remains a question for future investigation. As a result of these data validity issues, the relative magnitudes of the cost comparisons should be considered, not the specific point estimates.

The second limitation was that average direct cost per primary care visit and average primary care direct cost per patient excluded ancillary care costs, because we were unable to assign the costs of these services to the primary care encounter in multiple encounter visits reported in the National Extract. Given this attribution problem, outpatient ancillary care costs were considered separately and summed into the total outpatient direct cost and total direct cost per patient. In addition, CBOC-specific primary care could not be differentiated from VAMC primary care for CBOC patients because the DSS Outpatient National Extract only had three-digit station numbers to differentiate encounters.

The third serious limitation concerns case-mix adjustment. It is possible that patients treated at VA-staffed CBOCs are healthier or sicker than patients treated at the primary care clinics of the Parent VAMCs in ways that we were not able to capture. Case-mix differences between CBOC patients and primary care patients at the Parent VAMC may have resulted from 1) patient self-selection, 2) targeted enrollment/recruitment strategies at CBOCs, and/or 3) specific VA enrollment policies. If there are unobserved health status differences between CBOC and parent VAMC patients that we did not control for, our results may be biased. However, among patients

in the survey sample in Performance Report 1, SF-12 scores for CBOC and Parent VAMC patients were very similar (Physical component score CBOC=35.1, Parent VAMC=34.4; Mental component score CBOC=47.5, Parent VAMC=46.3).

Another limitation of the cost analysis concerns the length of time used to generate the Cost performance measures. In order to examine as large and representative sample of CBOCs as possible, only cost data for the last six months of FY98 were used. It is possible that a longer period of time would have generated slightly different results if there are seasonal differences in utilization.

For the Access performance measures, the statistical analyses are subject to several limitations. The travel distances were estimated using straight-line distances and zip code centroids. Therefore, the actual travel distances would have been greater than the straight-line distance estimates,[46] and at the same time could have been either greater or less than the estimates depending on the spatial relationship between veterans' residences and zipcode centroids. In addition, for the Access 5 analysis, the percent of VA primary care non-users was overestimated for both the CBOCs and Parent VAMCs, because veterans with primary care visits in the first two quarters of FY98 but none in the last two quarters were considered non-users for FY98, as were patients who received primary care at VA facilities other than CBOCs and Parent VAMCs.

A limitation that affects both the Access and Cost measures is that a relatively small number of CBOCs met the inclusion criteria for the analyses, therefore it is possible that these CBOCs are not fully representative of all the CBOCs currently in operation. Furthermore, for the Cost measures, no Contract CBOCs were included because of uncertain validity of DSS costs data for these facilities. In addition, many of the CBOCs included in the analyses were in operation only a short period of time before the evaluation period began. A future comparison of CBOCs and Parent VAMCs may generate different results once CBOCs have been operating for a longer period. Therefore, these results cannot be generalized to all CBOCs in the VA system or to CBOCs in past or future time periods.

Another limitation of the study concerns the classification of patients who had primary care stops at both the CBOC and the Parent VAMC during the study period. Taking an intent-to-treat perspective, any veteran who had at least one visit to a CBOC during 4/1/98 to 9/30/98 was defined as a CBOC patient. In Performance Report 1, 14.1% of veterans classified as CBOC patients also had at least one stop at the primary care clinic of the Parent VAMC during the study period, but only 3.1% of CBOC patients had more primary care stops at the Parent VAMC than the CBOC. Because such a small percentage of CBOC patients had more stops at the Parent VAMC than the CBOC, the effect of any misclassification is probably small.

All performance measures in this report involve comparisons between CBOCs and their affiliated Parent VA facility. It should be noted that in some instances, veterans may have sought care at a VA facility other than the Parent VA facility that may have been geographically

[46] A recent study found a conversion rate of 1.75 minutes per one mile straight-line distance. Fortney J, Rost K, and Warren J. Comparing Alternative Methods of Measuring Geographic Access to Health Services. *Health Services and Outcomes Research Methodology* (in press).

closer to the CBOC. Comparisons between CBOCs and such VA facilities may also be relevant in addition to the CBOC vs. Parent VA facility comparisons presented in this report.

APPENDIX B

COMPARISON OF ACTUAL AND PREDICTED COSTS

The following three tables provide actual and predicted costs for the three cost measures, as well as actual and predicted costs for other components of total costs, including average specialty direct cost per patient, average ancillary direct cost per patient, and average inpatient direct cost per patient. Table 1 provides cost estimates for CBOC patients and VAMC patients. Table 2 provides cost estimates for patients in urban and rural CBOCs. Finally, Table 3 shows cost estimates for patients in new and old CBOCs. All calculations are based on direct costs only, because indirect costs were excluded.

Differences in the point estimates for actual and predicted costs of a specific cost category (e.g., primary care cost per patient for CBOC patients) may vary for two reasons. First, the predicted costs are based upon case-mix adjusted regressions that control for case-mix and demographic differences in the two groups, which the actual cost estimates do not. Second, the actual and predicted costs are based on different samples. Actual costs are based upon the sub-sample of patients in each group (e.g., CBOC patients only in Table 1). The predicted costs are based upon the average patient in both groups (e.g., CBOC and VAMC patients in Table 1), not the average or typical CBOC patient.

In Table 1, the predicted costs in each category address the following question: How does the cost differ for an average patient that is seen in a VA-staffed CBOC or VAMC?

Table 1. Actual and Predicted Direct Costs for Patients in CBOCs and Parent VAMC Primary Care Clinics, 4/1/98-9/30/98

	CBOC Patients		VAMC Patients	
	Actual	Predicted	Actual	Predicted
Direct Cost Per Primary Care Visit (Cost 1)***	$76.05	$121.90	$77.66	$104.75
Primary Care Direct Cost Per Patient (Cost 2)**	$160.56	$204.87	$176.86	$176.31
Specialty Care Direct Cost Per Patient	$201.48	$463.42	$552.39	$552.61
Ancillary and Other Direct Cost Per Patient***	$207.62	$91.01	$448.30	$463.46
Total Outpatient Direct Costs***	$569.67	$759.30	$1177.55	$1192.39
Total Inpatient Direct Costs	$54.38	$421.50	$350.60	$459.17
Overall Direct Costs (Cost 3)***	$624.05	$1180.80	$1528.16	$1651.55
Sample Size	8,227		131,051	

Note significance of predictions: *** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.10$

In Table 1, CBOC patients have lower actual costs for specialty, ancillary, and inpatient care. Actual primary care costs per visit and per patient (Cost 1 and Cost 2) are not significantly different. The predicted primary care costs per visit and per patient are significantly different, with CBOC patients having higher primary care costs. Predicted ancillary costs remain

significantly different, but predicted specialty and inpatient care costs are not significantly different.

For Table 2, the predicted costs in each category address the following question: How does the cost differ for the (same) average CBOC patient that is seen in an urban or rural CBOC? An average patient for this analysis is the average of all patients seen at the urban and rural CBOCs (N=6892+1335).

Table 2. Actual and Predicted Direct Costs of Patients in Urban/Rural CBOCs, 4/1/98-9/30/98

	Urban CBOC Patients		Rural CBOC Patients	
	Actual	Predicted	Actual	Predicted
Direct Cost Per Primary Care Visit (Cost 1)***	$78.62	$82.69	$62.25	$43.71
Primary Care Direct Cost Per Patient (Cost 2) ***	$160.44	$176.10	$160.95	$105.64
Specialty Care Direct Cost Per Patient***	$182.02	$194.26	$301.64	$385.52
Ancillary and Other Direct Cost Per Patient	$198.03	$213.84	$256.84	$253.20
Total Outpatient Direct Costs**	$540.50	$584.20	$719.42	$744.36
Total Inpatient Direct Costs*	$55.58	$201.26	$48.10	$126.85
Overall Direct Costs (Cost 3)	$596.08	$785.47	$767.53	$871.21
Sample Size	6,892		1,335	

Note significance of predictions: *** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.10$

The actual direct cost per primary care visit is significantly greater for patients in urban CBOCs than for patients in rural CBOCs. This significant finding remains in the predicted average direct cost per primary care visit. Actual primary care direct cost per patient is not significantly different in the two groups, but the predicted primary care cost per patient is higher for patients in urban CBOCs. Actual total costs are significantly higher for patients in rural CBOC patients, because specialty care costs are significantly higher for this group. However, predicted total costs are similar in the two groups. One notable difference is the switch in ancillary care costs. Actual and predicted ancillary care costs are higher for patients in urban CBOCs than for patients in rural CBOCs. The case-mix adjusted estimates are more reliable, because they controls for health status differences in the two groups of VA-staffed CBOC patients and addresses the question posed in the CBOC Performance Evaluation Project.

In Table 3, the predicted costs in each category address the following question: How does the cost differ for the (same) average CBOC patient that is seen in an new or old CBOC? An average patient for this analysis is the average of all patients seen at new and old CBOCs (N=2,692 and 5,535).

Table 3. Actual and Predicted Direct Costs of Patients in New/Old CBOCs, 4/1/98-9/30/98

	Patients in New CBOCs	Actual Predicted	Patients in Old CBOCs	Actual Predicted
Direct Cost Per Primary Care Visit (Cost 1)***	$57.87	$102.59	$85.33	$63.61
Primary Care Direct Cost Per Patient (Cost 2)***	$121.48	$212.08	$179.51	$141.61
Specialty Care Direct Cost Per Patient***	$132.26	$96.62	$235.08	$287.88
Ancillary and Other Direct Cost Per Patient	$178.33	$193.74	$221.80	$233.10
Total Outpatient Direct Costs**	$432.07	$502.44	$636.39	$662.60
Total Inpatient Direct Costs*	$31.53	$239.26	$65.47	$164.84
Overall Direct Costs (Cost 3)	$463.60	$741.69	$701.87	$827.44
Sample Size	2,692		5,535	

Note significance of predictions: *** = $p < 0.01$, ** = $p < 0.05$, * = $p < 0.10$

Another notable switch occurs in these cost comparisons. The actual average direct cost per primary care visit is higher for patients in old CBOCs than for patients in new CBOCs, but the predicted cost is higher for patients in new CBOCs. This switch is also a result of case-mix adjustment and the use of the average patient, which is drawn largely from the sample of patients in old CBOCs. A similar switch occurs with average primary care direct cost per patient, in that actual costs are higher for patients in old CBOCs but predicted costs are higher for patients in new CBOCs.

Specialty care costs are significant for both actual and predicted costs and are consistently higher for patients in old CBOCs. Finally, actual inpatient direct costs are significantly higher for patients in old CBOCs, but predicted costs are higher for patients in new CBOCs.

Appendix C

CBOCs Included in Performance Report 2

VISN	CBOC Station #	CBOC Name	Parent VA	Parent VA #	CBOC Type	Urban/ Rural	1st Veteran Visit
1	608GA*	VA Primary Care Clinic, Pease Air National Guard Base	Manchester	608	VA-staffed	Urban	Mar-97
2	500GC	Glen Falls Primary Care Practice	Albany	500	Contract	Urban	Oct-97
2	670GE*	Binghamton CBOC	Syracuse	670	VA-staffed	Urban	Dec-96
3	527GA	Staten Island Veterans Health Care Center	Brooklyn	527	VA-staffed	Urban	Jan-96
3	561GA*	Trenton Health Practice	New Jersey HCS	561	VA-staffed	Urban	Jan-96
3	561HA*	Hackensack Health Practice, Bergen County	New Jersey HCS	561	VA-staffed	Urban	Aug-95
4	460GA	VA Primary Care Clinic, Millsboro	Wilmington	460	Contract	Rural	Mar-98
4	642GA*	Outpatient Clinic at Marshall Hall, Ft Dix	Philadelphia	642	VA-staffed	Urban	Oct-97
4	642GB*	VA Outpatient Clinic at Cape May	Philadelphia	642	VA-staffed	Urban	Oct-97
4	693GB*	Williamsport CBOC	Wilkes-Barre	693	VA-staffed	Urban	Jul-97
4	693GC*	Tobyhanna CBOC	Wilkes-Barre	693	VA-staffed	Rural	Dec-97
6	658GA	Tazewell Family Physicians	Salem	658	Contract	Rural	Aug-97
7	619GB	VA Outpatient Clinic, Dothan	Central Alabama HCS	619	Contract	Urban	Dec-97
8	516GA*	Sarasota CBOC	Bay Pines	516	VA-staffed	Urban	May-97
8	546GC*	Homestead CBOC	Miami	546	VA-staffed	Urban	May-97
8	673GB	Bartow CBOC	Tampa	673	VA-staffed	Urban	Aug-97
10	538GA*	DVA CBOC, Athens	Chillicothe	538	VA-staffed	Rural	Aug-97
10	541GB	DVA CBOC, Lorain	Cleveland	541	VA-staffed	Urban	Sep-97

* CBOCs with an asterisk are included in the analyses for the Cost and Access measures. CBOCs with no asterisk are only included in the analyses for the Access measures.

APPENDIX C

CBOCs Included in Performance Report 2 – continued

VISN	CBOC Station #	CBOC Name	Parent VA	Parent VA #	CBOC Type	Urban/ Rural	1st Veteran Visit
10	541GC	DVA CBOC, Sandusky	Cleveland	541	VA-staffed	Rural	Mar-98
10	552HA	DVA CBOC, Springfield	Dayton	552	VA-staffed	Urban	Feb-98
12	537HA	Woodlawn Clinic, Chicago	Chicago HCS, West Side	537	VA-staffed	Urban	Oct-95
12	585GA	Hancock Clinic	Iron Mountain	585	VA-staffed	Rural	May-97
14	555HB*	VA Clinic, Mason City	Central IA HCS	555	VA-staffed	Rural	Jan-98
14	584GB	Waterloo Outpatient Clinic	Iowa City	584	VA-staffed	Urban	Jan-98
15	609GA*	Mt. Vernon CBOC	Marion	609	VA-staffed	Rural	Mar-97
15	677GA	St. Joseph VA Outpatient Clinic	Leavenworth	677	VA-staffed	Urban	Sep-97
16	586GA	Durant CBOC	Jackson	586	Contract	Rural	Jul-97
17	674HA	Hamilton CBOC	Central Texas HCS	674	Contract	Rural	Apr-95
18	519GA	VA Medical Clinic in Odessa	Big Spring	519	VA-staffed	Urban	Feb-98
18	519HC	VA Medical Clinic in Abilene	Big Spring	519	VA-staffed	Rural	Dec-95
18	649GA*	Kingman CBOC	Prescott	649	VA-staffed	Urban	Mar-98
18	678GA*	Sierra Vista CBOC, Ft Huachuca	Tucson	678	VA-staffed	Rural	Apr-97
18	678GB*	Yuma CBOC	Tucson	678	VA-staffed	Urban	Oct-97
19	554GB*	Aurora CBOC	Denver	554	VA-staffed	Urban	Jan-98
19	666GB*	Casper CBOC	Sheridan	666	VA-staffed	Urban	Apr-97
22	605GA	Victorville CBOC	Loma Linda	605	Contract	Urban	Jul-97
22	664GA	El Centro CBOC	San Diego	664	Contract	Rural	Jan-96
22	691GC	Gardena	Greater LA HCS	691	VA-staffed	Urban	May-97

* CBOCs with an asterisk are included in the analyses for the Cost and Access measures. CBOCs with no asterisk are only included in the analyses for the Access measures.